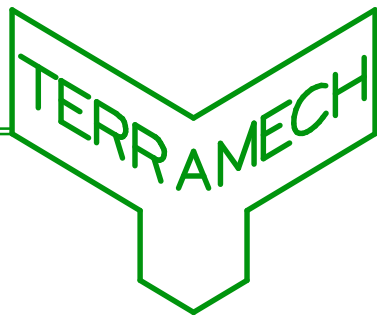




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Our Ref: 4008 Gas Addendum Letter

11 October 2018

Dear Parmod

RE SITE AT 28 WOKINGHAM ROAD, READING, RG6 1JQ

Terramech recently issued a Site Investigation report for the above site (ref 4008) although at the time of issue only a single round of gas monitoring had been undertaken.

This letter report presents the results of two further rounds of gas monitoring undertaken at the site on 29th June and 19th September 2018.

Background information

Report 4008 includes a detailed Phase 1 desk study and reference should be made to that document. The pertinent information relating to gas risk is summarised below:

- BGS mapping identified the underlying geology as bedrock of the Seaford Chalk, Lewes nodular chalk, and Newhaven chalk Formations (undifferentiated) overlain superficial clay-with-flints
- Superficial deposits of the Taplow Gravel Formation are also mapped to overlying the chalk
- No landfills were identified proximal to the site
- Similarly, no features such as suspected infilled quarries, ponds or pits deemed to present a gas risk to the site were identified.
- Intrusive works proved a generally thin mantle of topsoil/made ground (>0.8m), although locally up to 2.2m was recorded.
- There is no requirement for radon protection measures at the site
- The site was identified as a former fuel filling station, with the potential for ground gases including volatile organic compounds (VOCs) to be present
- Five monitoring wells were installed at the site; WS1, WS2a, WS3, WS4 and WS5
- Each of the wells were installed to base depth (up to 4.0m) with the top meter comprising a 'plain' pipe/bentonite sealed zone. The lower 3m were installed with slotted pipe surrounded by a gravel annulus.

Based on the above, the conceptual site model identified a potential viable pollutant linkage.

Results and discussion

The potential for ground gases has been assessed and a total of three monitoring visits has been undertaken (24/4/18, 29/6/18 & 18/9/18). The most recent of these visits occurred during a period of unsettled weather and following a recent fall in atmospheric pressure. These conditions can be considered to be approaching 'worst case' with respect to potential ground gas generation.

Monitoring was undertaken via a GA 5000 plus gas analyser.

The monitoring has shown that a maximum concentration for Methane of 0.0% and a maximum concentration for Carbon Dioxide of 4.4% were recorded across all three visits. A maximum active gas flow rate of 0.4 l/hr was detected. It is considered likely that the low levels of carbon dioxide detected is attributable to slow natural releases emanating from the underlying chalk.

Trace quantities of VOCs were also detected.

CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings' has been used to determine the gas guideline value and characteristic situation for the Methane and Carbon Dioxide concentrations determined.

For Methane, a gas screening value of 0 l/hr has been determined.

For Carbon Dioxide, a gas screening value of 0.0176 l/hr has been determined based on an active gas flow of 0.4%.

It should be noted that Carbon Dioxide does not represent an explosion risk, and that Carbon Dioxide is not intrinsically toxic. Carbon Dioxide causes asphyxia at high concentrations purely by exclusion/displacement of Oxygen.

Based on the information above and using the 'modified Wilson and Card classification' scheme, a Characteristic situation 1 has been determined for the site.

Notwithstanding the above and considering the former fuel filling station usage of the site and considering the hydrocarbon quantities detected in the soils (see Ph2 report 4008) it is strongly recommended that a membrane impermeable to hydrocarbons, including volatile compounds such as Ethylbenzene and Xylene, is installed to protect against the ingress of vapours and nuisance odours.

This membrane should be installed in accordance with the manufacturers guidance and must be suitably lapped and sealed around services entries, cavities etc by a competent person. Due to the effect of the volatile hydrocarbons detected in the soil, taped joints may be compromised. As a result, most proprietary membranes for these contaminants are normally thermally welded where practicable. Throughout the design and installation process, reference should be made to CIRIA C735 so suitable verification can be undertaken post completion.

Yours sincerely

A handwritten signature in black ink, appearing to read 'MR Green', with a stylized, wavy line extending to the right.

M. R. Green BSc (hons) FGS
For and on Behalf of
Terramech Investigations Ltd

PAGE:	4008	GAS MONITORING
DATE: 18/09/2018	28 Wokingham Road, Reading	

Monitoring Date: 18/09/2018 **Ambient Gas Conc.:** CH4 (%): 0.0 CO2 (%): 0.1 O2 (%): 20.9
Monitoring Engineer: WC CO (ppm): 0.0 H₂S (ppm): 1.0 VOCs (ppm): 0.0
Weather/Wind: 21°C - 10km SW **Weather Trend:** Unsettled **Atm. Press. Trend** Failing
Remarks: - **Equipment:** Geotech GA5000

Borehole ID	Atmospheric Barometric Pressure (mb)	Borehole Barometric Pressure (mb)	Flow (l/hr)	Time (sec)	Methane CH4 (%)	Carbon Dioxide CO2 (%)	Oxygen O2 (%)	Carbon Monoxide CO (ppm)	Hydrogen Sulphide H2S (ppm)	Volatile Organic Compounds VOCs (ppm)	Water Level (m)
WS1_	1005	-0.19	Initial:	15	0	2.5	18.3	26	0	0.3	GL - 3.04 contains surface water
				30	0	2.5	17.5	4	0	0.3	
			0.1	45	0	2.5	17.5	1	0	0.3	
				60	0	2.5	17.4	0	0	0.3	
			Peak:	75	0	2.5	17.4	0	0	0.3	
				90	0	2.5	17.4	0	0	0.3	
			0.4	105	0	2.5	17.4	0	0	0.3	
				120	0	2.5	17.4	0	0	0.3	
			Average:	135	0	2.5	17.4	0	0	0.3	
				150	0	2.5	17.4	0	0	0.3	
			0.3	165	0	2.5	17.4	0	0	0.2	
				180	0	2.5	17.4	0	0	0.2	
Borehole ID	Atmospheric Barometric Pressure (mb)	Borehole Barometric Pressure (mb)	Flow (l/hr)	Time (sec)	Methane CH4 (%)	Carbon Dioxide CO2 (%)	Oxygen O2 (%)	Carbon Monoxide CO (ppm)	Hydrogen Sulphide H2S (ppm)	Volatile Organic Compounds VOCs (ppm)	Water Level (m)
WS2_	1005	-0.14	Initial:	15	0	4.3	15.9	5	0	0.5	GL - 2.90 dry
				30	0	4.4	14.3	1	0	0.5	
			0.0	45	0	4.4	14.2	0	0	0.5	
				60	0	4.4	14.2	0	0	0.5	
			Peak:	75	0	4.4	14.2	0	0	0.5	
				90	0	4.4	14.2	0	0	0.5	
			0.3	105	0	4.4	14.2	0	0	0.5	
				120	0	4.4	14.2	0	0	0.5	
			Average:	135	0	4.4	14.2	0	0	0.4	
				150	0	4.4	14.2	0	0	0.4	
			0.2	165	0	4.4	14.2	0	0	0.4	
				180	0	4.4	14.2	0	0	0.4	
Borehole ID	Atmospheric Barometric Pressure (mb)	Borehole Barometric Pressure (mb)	Flow (l/hr)	Time (sec)	Methane CH4 (%)	Carbon Dioxide CO2 (%)	Oxygen O2 (%)	Carbon Monoxide CO (ppm)	Hydrogen Sulphide H2S (ppm)	Volatile Organic Compounds VOCs (ppm)	Water Level (m)
WS3_	1005	-0.51	Initial:	15	0	2.5	17.8	0	0	0.8	GL - 2.80 dry
				30	0	2.5	16.8	0	0	1.0	
			0.1	45	0	2.5	16.7	0	0	1.1	
				60	0	2.5	16.8	0	0	1.2	
			Peak:	75	0	2.5	16.8	0	0	1.2	
				90	0	2.5	16.8	0	0	1.2	
			0.2	105	0	2.5	16.8	0	0	1.2	
				120	0	2.5	16.9	0	0	1.2	
			Average:	135	0	2.5	17	0	0	1.2	
				150	0	2.5	17	0	0	1.2	
			0.2	165	0	2.5	17.1	0	0	1.1	
				180	0	2.5	17.1	0	0	1.1	

PAGE:	4008	GAS MONITORING
DATE: 18/09/2018	28 Wokingham Road, Reading	

Monitoring Date: 18/09/2018
Monitoring Engineer: WC
Weather/Wind: 21°C - 10km SW
Remarks: -

Ambient Gas Conc.:
CH4 (%): 0.0
CO (ppm): 0.0
Weather Trend: Unsettled

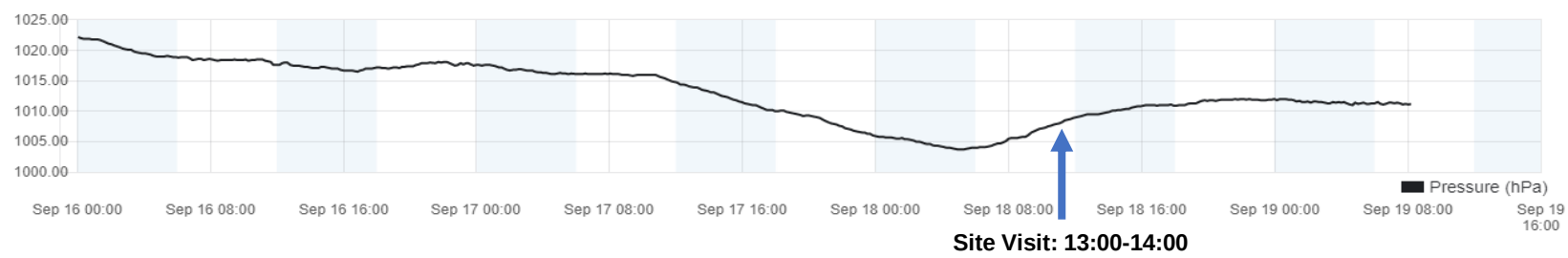
CO2 (%): 0.1
H2S (ppm): 1.0
Atm. Press. Trend: Failing
Equipment: Geotech GA5000

O2 (%): 20.9
VOCs (ppm): 0.0

Borehole ID	Atmospheric Barometric Pressure (mb)	Borehole Barometric Pressure (mb)	Flow (l/hr)	Time (sec)	Methane CH4 (%)	Carbon Dioxide CO2 (%)	Oxygen O2 (%)	Carbon Monoxide CO (ppm)	Hydrogen Sulphide H2S (ppm)	Volatile Organic Compounds VOCs (ppm)	Water Level (m)
WS4_	1005	-1.01	Initial:	15	0	2.9	16	4	0		GL - 1.93 dry
				30	0	2.9	14.3	1	0		
			0.0	45	0	2.9	14.3	1	0		
				60	0	2.9	14.3	0	0		
			Peak:	75	0	2.9	14.3	0	0		
				90	0	2.9	14.3	0	0		
			0.2	105	0	2.9	14.3	0	0		
				120	0	2.9	14.3	0	0		
			Average:	135	0	2.9	14.3	0	0		
				150	0	2.9	14.3	0	0		
WS5_	1005	-0.05	Initial:	15	0	0.4	19.9	1	0	0.8	GL - 2.31 dry
				30	0	0.4	19.9	0	0	1.0	
			0.1	45	0	0.4	19.8	0	0	1.2	
				60	0	0.4	19.9	0	0	1.3	
			Peak:	75	0	0.4	19.9	0	0	1.4	
				90	0	0.4	19.9	0	0	1.4	
			0.3	105	0	0.4	19.9	0	0	1.4	
				120	0	0.4	19.9	0	0	1.3	
			Average:	135	0	0.4	19.9	0	0	1.3	
				150	0	0.4	19.9	0	0	1.3	
			0.3	165	0	0.3	20	0	0	1.2	
				180	0	0.3	20	0	0	1.2	

PAGE:	4008	GAS MONITORING
DATE: 18/09/2018	28 Wokingham Road, Reading	

Monitoring Date:	18/09/2018	Ambient Gas Conc.:	CH4 (%): 0.0	CO2 (%): 0.1	O2 (%): 20.9
Monitoring Engineer:	WC		CO (ppm): 0.0	H ₂ S (ppm): 1.0	VOCs (ppm): 0.0
Weather/Wind:	21oC - 10km SW	Weather Trend:	Unsettled	Atm. Press. Trend	Failing
Remarks:	-			Equipment:	Geotech GA5000



Local Weather Station Atmospheric Pressure Records for 16th to 19th September 2018.

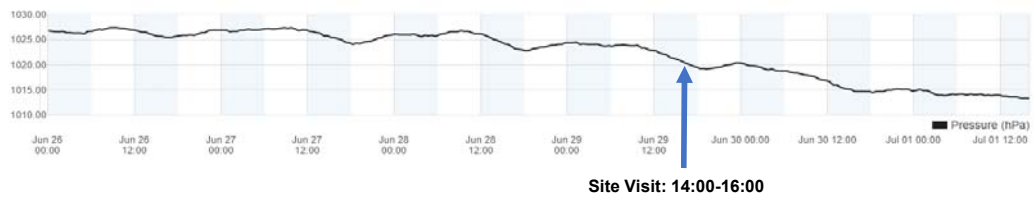
NB Note: The weather station atmospheric pressure is normally corrected for attitude (providing an equivalent sea level atmospheric pressure), whereas the GA5000 gas analyser measures absolute atmospheric pressure at the sites altitude, therefore a difference in pressures is to be expected between the local station data and the gas analyser data. The graph above has been appended purely to give an indication of pressure trends prior to the monitoring visit.

PAGE:	4008	GAS MONITORING
DATE: 29/06/2018	28 Wokingham Road, Reading	

Monitoring Date: 29/06/2018 Monitoring Engineer: WC Equipment: Geotech GA5000
 Condition of Well: - Ambient Gas Conc.: CH4(%): 0 CO2(%): 0 O2(%): 20.9
 Weather/Wind: Dry Weather Trend: Settled Atm. Press. Trend: Drop
 Remarks: -

Borehole ID	Atmospheric Barometric Pressure (mb)	Borehole Barometric Pressure (mb)	Flow (l/hr)	Time (sec)	Methane CH4 (%)	Carbon Dioxide CO2 (%)	Oxygen O2 (%)	Carbon Monoxide CO (ppm)	Hydrogen Sulphide H2S (ppm)	Volatile Organic Compounds VOCs (ppm)	Water Level (m)
WS1_	1015	0	Initial:	15	0	1	19.5	12	0	1.4	Concrete level - 3.06m Standpipe - 2.95m
				30	0	1	19.2	4	0	1.1	
			0.0	45	0	1.1	19.1	3	0	1.0	
				60	0	1.3	18.9	3	0	1.0	
			Peak:	75	0	1.4	18.8	3	0	0.9	
				90	0	1.3	18.9	3	0	0.8	
			0.0	105	0	1.3	19	3	0	0.8	
				120	0	1.4	18.9	3	0	0.7	
			Average:	135	0	1.4	18.7	3	0	0.7	
				150	0	1.4	18.8	3	0	0.7	
WS2_	1015	0.03	Initial:	15	0	0	20.7	3	0	2.7	Concrete level - 1.29m Standpipe - 1.15m
				30	0	0	20.7	3	0	2.8	
				45	0	0	20.8	3	0	2.9	
				60	0	0	20.8	3	0	2.8	
			Peak:	75	0	0	20.8	3	0	2.8	
				90	0	0	20.8	3	0	2.7	
			0.1	105	0	0	20.8	3	0	2.6	
				120	0	0	20.7	3	0	2.4	
			Average:	135	0	0	20.7	3	0	2.3	
				150	0	2.9	16.6	8	0	2.2	
WS3_	1015	0.15	Initial:	15	0	2.3	17.6	5	0	4.6	Concrete level - 2.85m Dry hole
				30	0	2.3	16.9	3	0	5.7	
			0.1	45	0	2.4	16.9	3	0	6.1	
				60	0	2.4	16.9	3	0	6.1	
			Peak:	75	0	2.4	16.9	3	0	6.0	
				90	0	2.4	16.9	3	0	5.9	
			0.2	105	0	2.4	16.8	2	0	5.5	
				120	0	2.4	16.8	2	0	5.2	
			Average:	135	0	2.4	16.8	2	0	4.8	
				150	0	2.4	16.8	2	0	4.4	
			0.2	165	0	2.4	16.8	2	0	4.0	
				180	0	2.4	16.8	2	0	4.0	

Borehole ID	Borehole Barometric Pressure (mb)	Atmospheric Barometric Pressure (mb)	Flow (l/hr)	Time (sec)	Methane CH4 (%)	Carbon Dioxide CO2 (%)	Oxygen O2 (%)	Carbon Monoxide CO (ppm)	Hydrogen Sulphide H2S (ppm)	Volatile Organic Compounds VOCs (ppm)	Water Level (m)
WS4_	1015	0.12	Initial:	15	0	2.9	17.1	9	0	6.1	Concrete level - 1.95m Dry hole
				30	0	2.9	16.7	3	0	6.6	
				45	0	2.9	16.6	3	0	6.5	
			0.0	60	0	2.9	16.6	3	0	6.3	
				75	0	2.9	16.6	3	0	6.0	
				90	0	2.9	16.6	3	0	5.6	
			Peak:	105	0	2.9	16.6	3	0	5.1	
				120	0	2.9	16.6	3	0	4.8	
				135	0	2.9	16.6	3	0	4.4	
			Average:	150	0	2.9	16.6	3	0	4.0	
				165	0	2.9	16.6	3	0	3.5	
				180	0	2.9	16.6	3	0	3.2	
0.1											
Borehole ID	Borehole Barometric Pressure (mb)	Atmospheric Barometric Pressure (mb)	Flow (l/hr)	Time (sec)	Methane CH4 (%)	Carbon Dioxide CO2 (%)	Oxygen O2 (%)	Carbon Monoxide CO (ppm)	Hydrogen Sulphide H2S (ppm)	Volatile Organic Compounds VOCs (ppm)	Water Level (m)
WS5_	1015	0.05	Initial:	15	0	0.2	20	5	0	2.7	Concrete level - 2.35m Dry hole
				30	0	0.2	19.9	4	0	2.5	
				45	0	0.2	19.9	4	0	2.1	
			0.0	60	0	0.2	19.9	3	0	1.7	
				75	0	0.2	19.9	3	0	1.4	
				90	0	0.2	19.9	3	0	1.1	
			Peak:	105	0	0.2	19.9	3	0	1.1	
				120	0	0.2	19.9	3	0	1.0	
				135	0	0.2	19.9	3	0	1.0	
			Average:	150	0	0.2	19.9	3	0	0.9	
				165	0	0.2	19.9	3	0	0.9	
				180	0	0.2	19.9	3	0	0.9	
0.2											



Local Weather Station Atmospheric Pressure Records for 26th June to 1st July 2018.

NB Note: The weather station atmospheric pressure is normally corrected for attitude (providing an equivalent sea level atmospheric pressure), whereas the GA5000 gas analyser measures absolute atmospheric pressure at the sites altitude, therefore a difference in pressures is to be expected between the local station data and the gas analyser data. The graph above has been appended purely to give an indication of pressure trends prior to the monitoring visit.

Monitoring Date:24/04/2018Monitoring Engineer:Equipment:Geotech GA5000

Condition of Well:Ambient Gas Conc.: CH4(%)CO2(%)O2(%)

Weather/Wind:Weather Trend:Atm. Press. Trend

Remarks:

Borehole ID	Borehole Barometric Pressure (mb)	Atmospheric Barometric Pressure (mb)	Flow (l/hr)	Time (sec)	Methane CH4 (%)	Carbon Dioxide CO2 (%)	Oxygen O2 (%)	Carbon Monoxide CO (ppm)	Hydrogen Sulphide H2S (ppm)	Water Level (m)
WS1_	1007	0.09	Initial:	15	0	0.5	18.9	3	0	
				30	0	0.6	18.1	3	0	
			0.1	45	0	0.8	18.2	2	0	
				60	0	1.1	18.3	2	0	
			Peak:	75	0	1	18.4	2	0	
				90	0	0.9	18.4	2	0	
			0.1	105	0	0.9	18.5	2	0	
				120	0	0.9	18.5	2	0	
			Average:	135	0	1	18.4	2	0	
				150	0	0.9	18.4	2	0	
			0.1	165	0	0.8	18.5	2	0	
				180	0	0.8	18.4	2	0	
Borehole ID	Borehole Barometric Pressure (mb)	Atmospheric Barometric Pressure (mb)	Flow (l/hr)	Time (sec)	Methane CH4 (%)	Carbon Dioxide CO2 (%)	Oxygen O2 (%)	Carbon Monoxide CO (ppm)	Hydrogen Sulphide H2S (ppm)	Water Level (m)
WS2_	1007	0.03	Initial:	15	0	1.4	18.4	3	0	
				30	0	1.4	17.6	2	0	
			0.1	45	0	1.4	17.6	2	0	
				60	0	1.4	17.6	2	0	
			Peak:	75	0	1.4	17.6	2	0	
				90	0	1.4	17.6	2	0	
			0.1	105	0	1.4	17.6	2	0	
				120	0	1.5	17.6	2	0	
			Average:	135	0	1.5	17.6	2	0	
				150	0	1.5	17.6	2	0	
			0.1	165	0	1.5	17.6	2	0	
				180	0	1.5	17.6	2	0	
Borehole ID	Borehole Barometric Pressure (mb)	Atmospheric Barometric Pressure (mb)	Flow (l/hr)	Time (sec)	Methane CH4 (%)	Carbon Dioxide CO2 (%)	Oxygen O2 (%)	Carbon Monoxide CO (ppm)	Hydrogen Sulphide H2S (ppm)	Water Level (m)
WS3_	1007	0.05	Initial:	15	0	0.8	20.1	2	0	
				30	0	0.8	19.4	1	0	
			0.1	45	0	0.8	19.4	1	0	
				60	0	0.8	19.4	1	0	
			Peak:	75	0	0.8	19.4	1	0	
				90	0	0.8	19.4	1	0	
			0.1	105	0	0.8	19.4	1	0	
				120	0	0.8	19.4	1	0	
			Average:	135	0	0.8	19.4	1	0	
				150	0	0.8	19.4	1	0	
			0.1	165	0	0.8	19.4	1	0	
				180	0	0.8	19.3	1	0	
Borehole ID	Borehole Barometric Pressure (mb)	Atmospheric Barometric Pressure (mb)	Flow (l/hr)	Time (sec)	Methane CH4 (%)	Carbon Dioxide CO2 (%)	Oxygen O2 (%)	Carbon Monoxide CO (ppm)	Hydrogen Sulphide H2S (ppm)	Water Level (m)
WS4_	1007	0.07	Initial:	15	0	1.4	20	1	0	
				30	0	1.4	19.5	1	0	
			0.1	45	0	1.4	19.4	1	0	
				60	0	1.4	19.4	1	0	
			Peak:	75	0	1.4	19.4	1	0	
				90	0	1.4	19.4	1	0	
			0.1	105	0	1.4	19.4	1	0	
				120	0	1.5	19.5	1	0	
			Average:	135	0	1.5	19.5	1	0	
				150	0	1.5	19.5	1	0	
			0.1	165	0	1.5	19.5	1	0	
				180	0	1.5	19.5	1	0	
Borehole ID	Borehole Barometric Pressure (mb)	Atmospheric Barometric Pressure (mb)	Flow (l/hr)	Time (sec)	Methane CH4 (%)	Carbon Dioxide CO2 (%)	Oxygen O2 (%)	Carbon Monoxide CO (ppm)	Hydrogen Sulphide H2S (ppm)	Water Level (m)
WS5_	1007	0.12	Initial:	15	0	0.2	21.3	1	0	
				30	0	0.2	21.2	2	0	
			0.1	45	0	0.2	21.2	2	0	
				60	0	0.1	21.3	1	0	
			Peak:	75	0	0.1	21.4	1	0	
				90	0	0.1	21.4	1	0	
			0.1	105	0	0.1	21.4	1	0	
				120	0	0.1	21.4	1	0	
			Average:	135	0	0.1	21.4	1	0	
				150	0	0.1	21.3	1	0	
			0.1	165	0	0.1	21.3	1	0	
				180	0	0.1	21.3	1	0	